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BUREAU OF PLANT INDUSTRY BULLETIN NO. 82.

B. T. GALLOWAY, *Chief of Bureau.*

GRASS LANDS OF THE SOUTH ALASKA COAST.

BY

C. V. PIPER,

AGROSTOLOGIST IN CHARGE OF FORAGE PLANT INTRODUCTION.

GRASS AND FORAGE PLANT INVESTIGATIONS.

ISSUED AUGUST 22, 1905.



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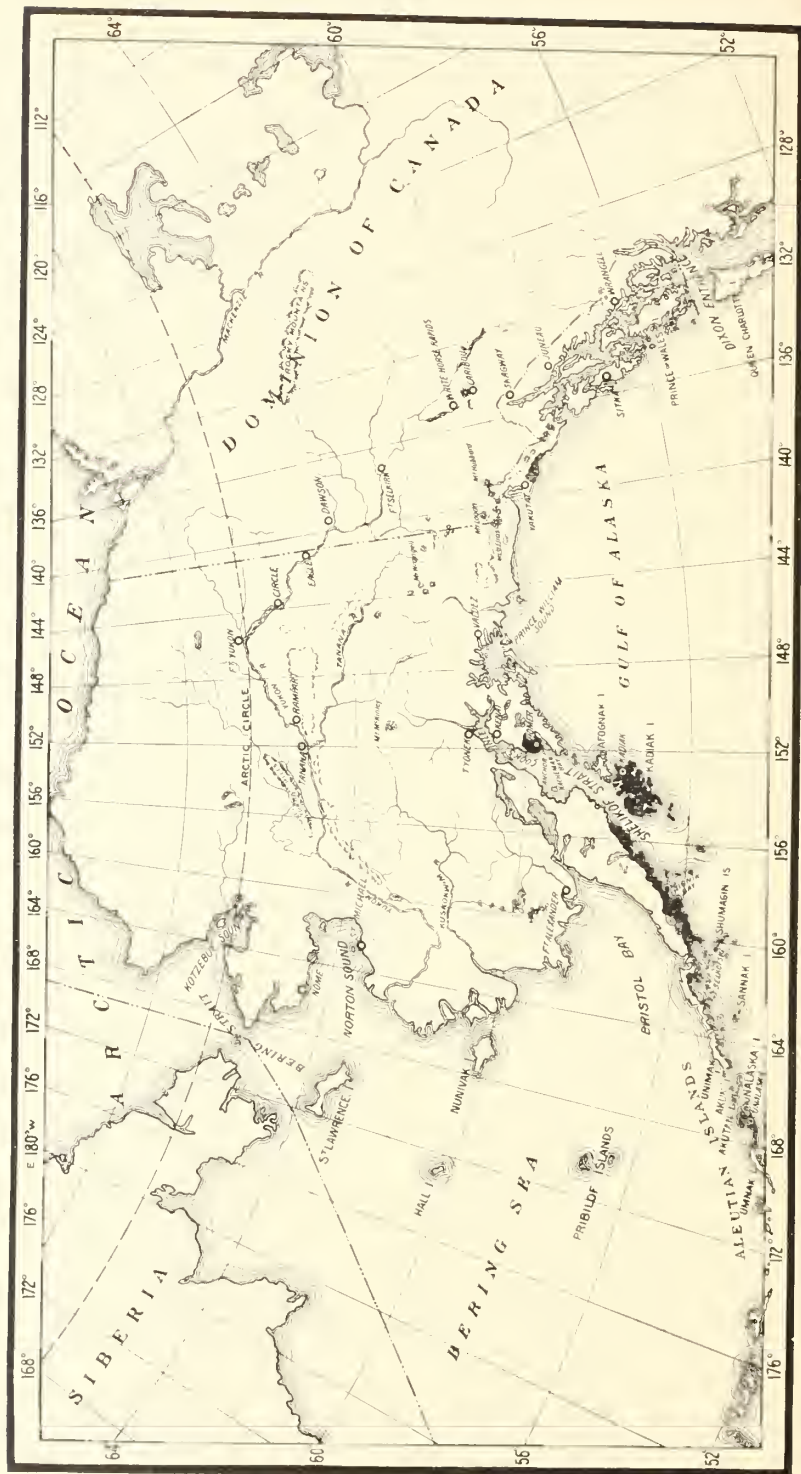
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MAP OF ALASKA.

U. S. DEPARTMENT OF AGRICULTURE.

BUREAU OF PLANT INDUSTRY — BULLETIN NO. 82.

B. T. GALLOWAY, *Chief of Bureau.*

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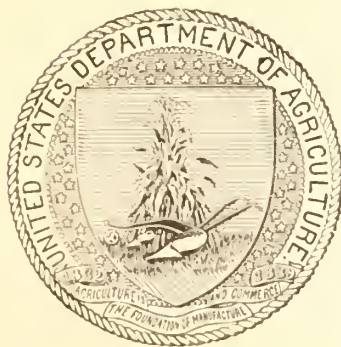
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GRASS AND FORAGE PLANT INVESTIGATIONS.

ISSUED AUGUST 22, 1905.



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1905.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
OFFICE OF THE CHIEF,
Washington, D. C., May 19, 1905.

SIR: I have the honor to transmit herewith a paper entitled "Grass Lands of the South Alaska Coast," and to recommend that it be published as Bulletin No. 82 of the series of this Bureau.

This paper was prepared by Mr. C. V. Piper, Agrostologist in Charge of Introduction of Grasses and Forage Plants, Grass and Forage Plant Investigations, and has been submitted by the Agrostologist with a view to publication.

The four plates accompanying the paper are necessary to a proper understanding of the text.

Respectfully,

B. T. GALLOWAY,
Chief of Bureau.

HON. JAMES WILSON,
Secretary of Agriculture.

PREFACE.

Since the discovery of gold in Alaska in 1897 continuous calls for information concerning the agricultural possibilities of the Alaska Peninsula have come to the Department of Agriculture. Much valuable information on this topic has been secured by the Office of Experiment Stations largely through the Alaska experiment stations at Sitka, Kenai, and Copper Center in charge of Prof. C. C. George-son, but as the work of these experiment stations was necessarily largely local in character, and as it was highly desirable to study conditions in sections remote from the stations, the Office of Experiment Stations requested the Bureau of Plant Industry to send some one to explore as large an area of the Alaskan country as might be feasible. Accordingly Prof. C. V. Piper, of the Office of Grass and Forage Plant Investigations, was detailed to make this exploration under the joint auspices of the Office of Experiment Stations and the Bureau of Plant Industry. The summer of 1904 was spent in this work. The area explored is shown in black on the map constituting Plate I. Many interesting facts relating to agricultural possibilities in the region covered were recorded, and Professor Piper discusses them in the following pages in detail.

For further information concerning the results of this exploration the reader is referred to the Annual Report of the Office of Experiment Stations for the year 1904.

W. J. SPILLMAN, *Agrostologist*,

OFFICE OF GRASS AND FORAGE PLANT INVESTIGATIONS,

Washington, D. C., April 14, 1905.

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GRASS LANDS OF THE SOUTH ALASKA COAST.

INTRODUCTION.

A glance at the accompanying map of Alaska (Pl. I) will show that the coast line beginning at Dixon Entrance, in longitude 132°, latitude 54° 30', and extending to Unalaska, in longitude 166° and latitude 54°, is nearly in the form of a semicircle, or, rather, of a half ellipse, the east and west diameter of which would be about 2,000 miles and the north and south diameter about half this distance. Near the northernmost part of this coast line are two large inlets, the eastern one Prince William Sound, the western one Cook Inlet. It will be further noticed that islands are very numerous on the coast and that the coast line is much indented by narrow inlets or fiords, a fact better shown on larger maps. The principal places mentioned in this paper are likewise indicated on the map. Officially, the region from Mount Saint Elias eastward is known as southeastern Alaska, that west of this peak as southwestern Alaska. From an agricultural standpoint, however, there is a much better and very marked dividing line. From Cook Inlet eastward practically all of the lands lying near the coast are densely timbered up to an altitude of 2,000 to 3,000 feet. From Cook Inlet westward, excepting Afognak Island and a small portion of Kodiak Island, the lands are devoid of timber, and are for the most part grass covered.

The total area of the coast grass lands is about 10,000 square miles, nearly all of which lies between Cook Inlet and Unalaska, a distance of about 700 miles. At least one-half of this land would seem capable, in time at least, of profitable utilization. From various causes it has remained until now practically unused.

South Alaska is a mountainous country, a great range of snow-capped peaks on the mainland paralleling the entire coast. Eastward from Cook Inlet great numbers of glaciers arise in the higher mountains, and many of these rivers of ice extend downward to the sea. Westward from Cook Inlet no glaciers reach the sea, although many of the mountain peaks are from 5,000 to 8,000 feet high. This striking difference apparently depends on a much smaller annual rainfall and snowfall.

In general the lands are hilly, sometimes rising abruptly from the seashore, but seldom too steep to afford a luxuriant grass covering. More often, however, the hills near the coast are low and rounded, with intervening valleys. In places there are wide areas contiguous to the coast of from 100 to 1,000 feet elevation and comparatively level. Most of the smaller islands, too, have comparatively gentle slopes, and either are under 1,000 feet elevation or have but few hills reaching above that height. The coast line everywhere is indented by numerous bays or inlets, into many of which rivers flow. At the heads of these bays there are, as a rule, considerable areas of flat or nearly flat lands. Such locations naturally afford the most advantageous sites for agricultural settlements, especially as these flat lands are exceedingly well grassed, and with little preliminary labor can be prepared for mowing.

Where the land is level it is very likely to be wet and covered with a growth of peat moss. Under such circumstances it supports but a scanty vegetation. Even on the hillsides this peat moss may become established, and where it does so the grasses quickly become less luxuriant. The decay of this moss and of other vegetation results in the formation of a humous soil, very retentive of moisture. So deep does this humus become that the real soil is often entirely concealed. Where it is possible to destroy this moss by burning, the result is always a heavy crop of grass or other plants. Most of the land that lies at less than 1,000 feet elevation is covered by a most luxuriant growth of native grasses. Over large areas these grasses are frequently 6 feet high, thus furnishing a large quantity of fodder. On the remaining areas, lying at higher elevations or on exposed slopes, the grasses are too short to cut for hay, but furnish splendid grazing.

That grass in Alaska is exceedingly abundant and fairly nutritious and that cattle will thrive upon it are facts beyond question. But these facts in themselves are not sufficient to enable a prospective settler thinking of engaging in stock raising to determine whether or not such a venture would be likely to prove profitable. The mere abundance of grass of fair quality is not sufficient to insure success in stock raising in an isolated region like that under consideration.

The following statements regarding the Alaska grass lands and the factors that have a bearing on their profitable utilization are based on as complete a survey as one season's work would permit, together with the facts previously recorded by reliable authorities. A detailed report of the conditions actually observed will appear in the Annual Report of the Office of Experiment Stations for 1904. The present bulletin designs rather to cite these facts in their bearing upon the south Alaska grass lands as a desirable field for stock raising.

THE LOCATION OF THE GRASS LANDS.

The accompanying map (Pl. I) indicates the general location of the southern Alaska areas which are covered with grasses. These areas differ considerably in detail and are here discussed separately.

KADIYAK ISLAND.

Kadiak Island, which lies off the mouth of Cook Inlet, is about 100 miles long by 50 miles wide. It is mountainous in character, the hills rising more or less gently from near the seashore to heights of 1,000 to 3,000 feet. At the end of July, 1901, there was still considerable snow at 2,000 feet (Pl. IV), but this is said to be quite unusual. This island, like most of the Alaska coast, is much cut into by long, narrow bays, into most of which flow streams. The flat lands lying at the deltas of these streams are, as a rule, very heavily covered with grasses (Pl. II). The slopes also, up to an altitude of 1,500 feet, are well grassed, except where there are thickets of alder or willow; but these slopes are usually too steep to utilize otherwise than by grazing. The total area of these hillside lands is much greater than that of the approximately level stretches, in the proportion of at least 20 to 1.

On the hillsides the principal grass is bluetop (*Calamagrostis lanquedorffii*), which often covers large areas in a pure growth. This was exceedingly fine on hillsides burned over in March, by which means the old straw and moss were destroyed, thus permitting better drainage and making the soil warmer. In such places this grass is often 6 feet high. On the contrary, if the hills are burned over in June the fire is likely to kill the grass roots as well as the moss, with the result that fireweed usually takes possession of the ground.

Other grasses than bluetop on the hillsides are relatively unimportant, though sometimes considerable areas of Siberian fescue occur, and on the higher slopes are a number of low grasses of forage value.

On the flat lands before mentioned the tall beach sedge (*Carex cryptocarpa*) forms a broad fringe along the shores of the bays and sloughs, especially on lands which are occasionally covered by tide water. Back of this sedge, beach rye (*Elymus mollis*) forms a more or less broad zone, often mixed with patches of a coarse bluegrass (*Poa glumaris*). In the still drier portions bluetop occupies the ground almost exclusively. The three plants mentioned furnish the great bulk of forage on Kadiak Island, and indeed on most parts of the Alaskan coast, but the bluetop is more abundant than all of the other grasses combined.

Bluetop has slender stems and thin leaves, thus curing very readily and making a sweet and palatable hay. Beach rye, on the contrary,

has thick stems and thick leaves, in consequence of which it cures slowly. Beach sedge has a three-sided, solid, pithy stem, and is therefore very difficult to dry. All three of these plants grow so luxuriantly that they often yield 3 tons of hay or more per acre.

Of forage plants other than grasses the lupine and fireweed, hereafter described, are both abundant. In a green state they are readily eaten by sheep, but cattle prefer the grasses.

In portions of the island which have been more or less closely grazed for some years it was noticeable that the taller wild grasses had largely disappeared, being replaced principally by bluegrass (*Poa pratensis*) and wild barley (*Hordeum boreale*). Cattle seem to be much more fond of the former than of the latter grass, although in parts of northern Europe the wild barley is considered a most excellent grass.

All of Kadiak Island, except a small portion in the extreme northeast, is practically timberless, as are most of the adjacent islands. In the valleys, however, there is usually a small number of cottonwoods and willows, and on wet slopes scrub willows and alders form dense thickets. Afognak Island, however, which lies northeast of Kadiak, is quite densely covered with spruce.

ALASKA PENINSULA AND ADJACENT ISLANDS.

The whole region to the west of Kadiak Island might briefly be described as similar to that island, but entirely devoid of timber, the shrubs being more scrubby and the grasses less luxuriant. The peninsula itself is very mountainous, and for considerable stretches along the coast the hills rise abruptly from the water's edge. In the bays and inlets, however, there are frequently considerable areas of comparatively level lands well grassed, though seldom as luxuriantly covered as those before mentioned. The islands lying off the coast are comparatively low, and some of them are said to be exceedingly well adapted to stock raising. Such areas as were examined indicate that in general there is a greater variety of forage grasses than to the eastward, but most of them are smaller in size.

At the present time there is a mail steamer plying once a month between Valdez and Unalaska. This boat carries the mail, and stops at such points as business demands. The population of this entire region is exceedingly sparse, and many of the outlying islands would probably have to be reached by means of sailing craft.

UNALASKA AND THE NEIGHBORING ISLANDS.

Unalaska and the neighboring islands differ on the whole comparatively little from Kadiak Island, though the vegetation as a rule is

decidedly less luxuriant. The grasses are much the same in kind, although differing in their relative abundance. Some difficulty would be experienced on these islands in finding sufficient tall grass to furnish winter fodder in case large quantities were necessary, though in some of the more sheltered valleys small areas were observed where the grasses were very tall. There is quite a herd of cattle at Unalaska which, according to local reports, receive but very slight attention during the winter, only a small quantity of feed being cut for them. The principal advantage of Unalaska and the neighboring islands would seem to lie in the fact that they are on the line of travel of the vessels going to the Yukon and to Nome. If sufficient numbers of cattle were raised on these islands, doubtless little difficulty would be experienced in finding a market for them at the above-mentioned points. Indeed, a Seattle company, which purposes, among other things, to engage in cattle raising primarily for these northern markets, has already begun operations on Akun Island.

KENAI PENINSULA.

Kenai is the name given to the large peninsula lying between Cook Inlet and the Gulf of Alaska. That portion of it on the east side of Cook Inlet and north of Kachemak Bay, comprising an area 100 miles long by 20 to 30 miles wide, is an extensive plateau. Its southern portion, on Kachemak Bay, lies 500 to 1,000 feet or more above the sea level. It slopes mainly to the westward, so that that part from Anchor Point northward is but 100 to 200 feet above the sea level. Most of this land is timbered with spruce, but there are considerable areas of grass near Anchor Point, near Homer, and on the north side of Kachemak Bay.

At Homer there is an extensive sand spit, about 4 miles in length and from one-fourth to 1 mile across, which supports a good growth of several grasses and sedges. Beach rye is the most important and most abundant, but red fescue, bluegrass, and seashore grass furnish considerable grazing. At the base of the spit the land rises gradually to the high plateau above, the scattered timber giving the appearance of mountain parks. The open portions of this land support a luxuriant growth of bluetop, often 6 feet tall. At a rough estimate the open grass lands in this vicinity comprise about 2,000 acres.

The site of a proposed Finnish colony is on the north side of Kachemak Bay, not far from its head. From the colony site to the head of the bay are extensive tide flats, which are mainly covered with sedges about 2 feet high. The marshy nature of these lands, together with the coarse nature of the forage, makes them of but limited value. Undoubtedly they can be much improved by diking.

The grass lands of the colony site proper consist of about 500 acres of excellent land, covered with a luxuriant growth of bluetop. These lands lie close to the seashore and less than 100 feet above it. Back of these lands are hills 500 to 1,500 feet high, the plateau on the top of which consists in part of extensive grass areas. Much of this grass is bluetop, often 6 feet high. Other areas are pure growths of Siberian fescue. Interspersed with these are several other good grasses, but none of them in great quantity. These plateau grass lands are apparently very extensive. To render them accessible will, however, require the building of roads or trails up to the easiest slopes. At Anchor Point there is but little grass land near the seashore, but on the plateau behind are considerable areas much like those just described. The plateau at this point is, however, much lower.

An important circumstance in relation to all of the grass lands of this region lies in the fact that they are underlaid with coal, which is exposed for miles in the bluffs along the coast. In view of this fact it is doubtful if title to the land can be gained by homesteading it.

At Kenai there are no naturally grassed lands, except the sand dunes along the beach and the marshes lying inside of them. The dunes are covered principally with beach rye and bighead sedge (*Carex macrocephala*). In the brackish marshes red fescue and seashore grass are plentiful. Here also is found poison parsnip (*Cicuta douglasii*) in small marshes, and there is a record of some native cows having been killed by it several years ago.

THE YAKUTAT PLAINS.

The only extensive areas of grass lands known in southeastern Alaska are those lying in the river valleys near the coast south of Yakutat. Inasmuch as these lands have been several times referred to in reports, and as they are now in part accessible owing to the building of the Yakutat and Southern Railway, a careful examination was made of them. The above-mentioned railway has been built primarily to reach the several rich salmon streams flowing into the ocean south of Yakutat, it being impracticable to fish them by approach from the ocean. This railway is projected to be built to the Alek River, a distance of 45 miles. At present it is built only to the Setuck River, 10 miles from Yakutat.

Practically the whole of this region is an old glacial moraine, composed of fine gravel, which slopes very gently to the seashore. The land close to the seashore is somewhat higher than that lying behind, and is heavily timbered. Owing to this strip of higher land most of the streams flow parallel to the coast for some distance near their debouchments. It is along the valleys of these streams that the grass

lands lie, but owing to the flatness of the land and the slight elevation above the sea level they are very ill-drained, notwithstanding the gravelly nature of the soil.

Traveling along these rivers in a canoe one receives the impression that the grass is tall and rank on these flat lands. This, in fact, is the case on a very narrow strip just along the river banks, where there is a fine growth of bluetop (*Calamagrostis langsdorffii*) and sedge (*Carex sitchensis* Presc.). This strip of tall grass is, however, nearly always confined to the immediate banks of the rivers. The great mass of the land is covered with a thin layer of bog moss, which supports but a scant vegetation of grass and sedges less than a foot high.

It is a conservative statement to say that fully 80 per cent of these Yakutat grass lands are thus scantily grassed. Apart from this scant amount of grass, which practically precludes the cutting of winter forage, another serious difficulty presents itself in the fact that poison parsnip (*Cicuta douglasii*) occurs quite plentifully over all the land that is the least boggy, which, as before stated, is 80 per cent of the area. Thus, even if these meadows were used only for grazing, great care would need to be exercised in the spring, when grass is scanty and the sweet but very poisonous tubers of this plant are frequently forced to the surface by the frost.

While the above statements are true concerning the Yakutat meadows as a whole, there are small areas which are exceptional. For example, along the lower Ankow River occurs a narrow strip of several hundred acres well grassed with silver-top (*Deschampsia cespitosa*) and beach rye (*Elymus mollis*) and free from Cicuta. Care would need to be exercised in utilizing even this, as the surrounding boggy lands bear an abundance of poison parsnip.

Again, the strip of land lying just within the ocean dunes is often well grassed with beach rye and red fescue (*Festuca rubra*).

A particularly good area of arable land lies along the railway where it reaches the Setnek River. This consists of 3 or 4 square miles of gravelly, well-drained, level land, at present looking much like a worn out meadow. It is apparently very well adapted to such cultivated grasses as smooth brome-grass and tall meadow oat-grass. It will undoubtedly grow all sorts of hardy vegetables. The present grass covering is rather scanty, but it is probable that this can be greatly increased by cultivation. This particular piece of land is well worthy of the attention of homesteaders.

It is within the bounds of possibility that the larger part of the Yakutat plain can be drained and made into fine meadow lands. In its present state, however, this land is not adapted to stock raising, with the exception of such small areas as above noted.

IMPORTANT FACTORS RELATING TO THE AGRICULTURAL VALUE OF THE GRASS LANDS.

In determining whether or not the grass lands previously described offer a desirable field for settlement, a number of factors that bear more or less directly upon the problem need consideration. These factors may be discussed in the following sequence:

- (1) The abundance and permanence of the feeds available.
- (2) The possibility of raising forage on cultivated lands.
- (3) The known facts in regard to live-stock raising.
- (4) The available markets.
- (5) Transportation facilities and freight rates.
- (6) The desirability of south Alaska as a home.
- (7) The choice of a location

THE ABUNDANCE AND PERMANENCE OF NATIVE FODDER PLANTS.

Live-stock husbandry in Alaska will have to depend primarily upon the native plants, supplemented in time, perhaps, by such additional ones as experiments shall indicate may compete with the native plants, or which upon cultivated land will yield heavily enough to be profitable. The most important and abundant of the native forage plants are as follows:

Bluetop.—Bluetop (*Calamagrostis langsdorfi*) is by far the most plentiful tall grass in Alaska, growing along the whole coast. On Kadiak Island and the Kenai Peninsula it is especially abundant, often being 6 feet high and very dense (Pl. III). It grows with special luxuriance on hillsides that have been burned over early in the spring. This burning destroys the moss, and thus makes the soil better drained and warmer. Bluetop also flourishes on the level boggy lands, but prefers a well-drained soil. Owing to its thin stems and leaves it cures very readily, and is therefore the usual hay grass of Alaska. It is often called redtop, but this name should be restricted to the true redtop, a very different grass.

There are no accurate data bearing on the point as to how well this grass will withstand continued cutting, but the general belief is that it rapidly becomes thinner in stand. It is noticeable about villages where cows are kept that the bluetop is scarce, being replaced by other grasses, especially bluegrass and wild barley. The area of bluetop is so great, however, that in many places it would be quite practicable to manage so as not to cut the same plats two years in succession, which practice would probably maintain the density of the stand.

Beach rye.—Along all the quiet shores and inlets of Alaska, wherever there is low land near the beach, there is a strip of beach rye (*Elymus mollis*) occurring just above high-tide level. Some-

times this strip is only a few feet wide, but on the low level lands near the heads of fiords there are often large areas of it 3 to 5 feet high (Pl. II, fig. 2). One patch of it examined had been cut the year previous, and on this the stand was scarcely half as dense as on neighboring pieces which had not been cut. This observation accords with the experience of others.

Where sand dunes occur on the coast, as at Kenai and near Yakutat, beach rye is an important sand binder. In such locations it is often very different in appearance from that found in other situations, the heads being short and thick. This is the result of infestation by a parasitic worm.

Bluegrass.—The true Kentucky bluegrass (*Poa pratensis*) is common all along the Alaska coast, where it thrives to perfection. It shows a tendency to occupy the ground where closely grazed, and cattle exhibit a marked preference for it. Several closely allied species also occur, and it is an important fact that they persist and increase where other grasses disappear, which seems to insure the permanence of pasturage of a high quality.

Silver-top.—The very nutritious grasses known as silver-top (*Deschampsia cespitosa* and *D. bottnica*) occur in some abundance, especially in gravelly soils, whether on the hillsides or near the seashore. Owing to their stems being nearly leafless they yield but little hay, but the numerous fine basal leaves furnish most excellent forage.

Siberian fescue.—Siberian fescue (*Festuca altaica*) makes large tussocks, especially in gravelly soil and in open timber up to 1,000 feet elevation. In such locations it often makes a nearly pure growth. It seems to be fully as nutritious as the well-known sheep fescue, but is a much larger grass.

Sedges.—Two tall species of sedge, *Carex cryptocarpa* and *C. sitchensis*, in places make dense stands 3 feet high or more, especially in wet soil; in the case of the former, more especially in tidal marshes. Considerable quantities of this sedge were cut for hay near Kadiak, and it is said to furnish excellent feed. These sedges are both quite smooth and soft, unlike most others.

Alaska lupine.—The blue-flowered plant known as Alaska lupine (*Lupinus analaschensis*) is quite tall, often 3 feet high, and sometimes occupies large areas almost to the exclusion of other plants. It is thick leaved and rather fleshy, and is the only leguminous plant that is really abundant in Alaska. Sheep eat it readily. Should it prove palatable as well as nutritious to cattle the problem of a good winter ration for milch cows would be considerably simplified. Experiments with it as silage, both pure and mixed with grass, are much to be desired.

With the exception of this plant the only legumes of forage value in the grass regions are two species of wild pea, both of which, unfortunately, are rather scarce.

Fireweed.—The well-known plant called fireweed (*Epilobium angustifolium*) often occupies the ground to the exclusion of others, especially where the land has been burned over in summer and the grass roots thus destroyed. Sheep seem fond of it. It is possible that this plant may prove profitable as silage, at least when mixed with grasses, but no tests with this end in view seem to have been made. Its great abundance at times makes such a test desirable.

There are three possible ways of preserving the above-mentioned plants for winter feed. The more easily dried—as bluetop and bluegrass—may be made into hay. Continued sunshiny weather on the Alaska coast is not to be depended upon, so that haymaking is accomplished only with much uncertainty. Where one needs but a small amount of fodder, little difficulty is experienced in selecting the few necessary sunshiny days. Where, on the contrary, one needs great quantities of winter feed, haymaking is impracticable. Resort in such cases must be had either to brown hay or to silage. Brown hay is simply half-cured hay, made by stacking the grass green or half dry—really a compromise between hay and silage. Sometimes salt is scattered over the layers while it is being stacked. It is more or less used in all countries where haymaking is difficult. While analyses show it to contain practically as much nutriment as hay or silage, cattle are not eager for it, and it can be considered only an emergency feed.

Unquestionably when large quantities of winter forage are needed for stock, silage must be depended upon, and undoubtedly, all things considered, it will be the most satisfactory feed. Practically the only Alaska forage plant thus far used as silage is beach rye, and the experiences with this plant of Prof. C. C. Georgeson, special agent in charge of the Alaska Agricultural Experiment Stations, and of others who have grown it, show it to be both palatable and nutritious. In all probability other Alaskan grasses, and perhaps other plants, will be found to be quite as satisfactory.

Where timber is available silos may be constructed of logs, like the one at the Sitka Experiment Station. This silo has the advantage of enabling a man to utilize his own labor. On the other hand, the material for stave silos can be secured at very reasonable prices, and this doubtless is the best silo to use in the timberless regions.

FOOD VALUE OF NATIVE ALASKAN GRASSES.

Chemical analyses have been made of the principal Alaskan grasses, and while these can be properly interpreted only in connection with

digestion experiments, their comparison with the analyses of standard grasses furnishes some measure of their value.

Analyses of Alaskan grasses (air-dried samples taken when in flower).

Species	Water	Protein.	Fat	Nitro- gen-free extract.	Crude fiber	Ash.
	<i>Percent.</i>	<i>Percent.</i>	<i>Percent.</i>	<i>Percent.</i>	<i>Percent.</i>	<i>Percent.</i>
<i>Calamagrostis longsdorffii</i> (Bluetop)	7.18	4.58	1.03	40.37	42.94	3.90
<i>Carex cryplocarpa</i> (Sedge)	5.85	10.32	2.12	45.34	25.72	10.65
<i>Elymus mollis</i> (Beach rye)	11.92	12.71	2.26	35.29	30.31	7.51
<i>Phleum pratense</i> (Timothy)	8.59	8.94	2.14	45.69	30.06	4.58
<i>Poa pratensis</i> (Bluegrass)	8.11	8.94	2.04	41.45	31.24	5.22
<i>Deschampsia botanica</i> (Silver-top)	8.75	7.44	2.05	47.05	31.54	4.15
<i>Calamagrostis aleutica</i>	8.33	10.00	1.37	37.89	38.89	4.52

Analyses of standard grasses for comparison.

Species.	Water.	Protein.	Fat.	Nitro- gen-free extract	Crude fiber.	Ash.
	<i>Percent.</i>	<i>Percent.</i>	<i>Percent.</i>	<i>Percent.</i>	<i>Percent.</i>	<i>Percent.</i>
<i>Poa pratensis</i> (Bluegrass)	17.44	10.80	3.45	46.10	22.09	7.35
<i>Agrostis alba</i> (Redtop)	14.30	8.48	2.84	46.77	21.71	5.90
<i>Phleum pratense</i> (Timothy)	15.01	6.01	3.01	41.90	20.50	4.48
<i>Dactylis glomerata</i> (Orchard grass)	14.30	7.34	2.28	47.08	23.58	5.42
<i>Deschampsia cespitosa</i> (Silver-top)	14.30	9.04	1.06	37.20	29.03	9.37
<i>Calamagrostis canadensis</i> (Bluejoint)	6.87	11.19	3.45	35.82	37.18	5.49

The analyses of the Alaskan grasses were all made by the Bureau of Chemistry of the Department of Agriculture, and with the exception of the first three, from material collected in 1904, were originally published in Bulletin No. 48, Office of Experiment Stations. The other analyses have been compiled from various authorities.

CULTIVABLE FORAGE CROPS.

The experiences of a number of individual investigators, as well as the tests made at the Sitka and Kenai experiment stations, throw a good deal of light on the possibility of growing fodder plants and forage crops on cultivated land. Much more testing is necessary, however, before some of the conclusions which at present seem probable can be considered demonstrated.

In the way of grasses the tests made at Sitka by Professor George-son on muck soils showed tall meadow oat-grass to be the most promising. Tall fescue, bluegrass, meadow foxtail, and redtop did fairly well, while orchard grass, timothy, and Italian rye-grass were not promising. From observations on a number of these and other grasses introduced by chance, some rather definite conclusions may be drawn. Timothy is more or less abundantly introduced at various places on the coast, but does not as a rule thrive very well, being often inferior in size to the native mountain timothy. It is altogether

probable, however, that a variety of timothy suited to the conditions might readily be secured by selection, as chance specimens of the plant seen were very fine. The success of such a selection, however, will largely depend on the possibility of growing seed in Alaska.

Among other useful grasses that have become accidentally introduced and show marked adaptability to the conditions are reedtop, rough-stalk meadow grass, bluegrass, and fowl meadow grass.

White clover thrives everywhere along the coast and is an aggressive plant. Red clover and alsike are not promising and alfalfa does not thrive.

In the way of cereals, the earliest varieties of oats and barley will mature for two or possibly three out of five seasons. Of course, such a crop is not entirely lost if the grain fails to mature, as it can be utilized as hay or silage. On this account it will probably be wisest to grow the crop mixed with field peas, as such a mixture will make excellent silage, whereas oats alone could only be preserved as hay, a difficult thing to do so late in the season. It is to be clearly understood that under present conditions it is unnecessary to plant any cultivated ground in such crops as grass, or perhaps even legumes. The above facts are of value simply as indicating what well-known forage plants will thrive, thus to some extent showing the future agricultural possibilities of Alaska.

SILAGE ALONE AS A RATION FOR MILCH COWS.

The writer has been unable to find any published data on results obtained by feeding milch cows nothing but grass silage. Presumably the best of results would not thus be obtained.

In order to obtain some light on the subject, Dr. James Withycombe, director of the Oregon Experiment Station, was requested to conduct such a test. The results of his experiment are reported as follows:

The silage test was made on a nonbreeding Jersey cow which freshened in February, 1902. In January, 1904, this cow was fed largely on silage, with a moderate amount of mill feed and light ration of hay as a preliminary preparation. From February 1 to April 30 she was fed wholly on corn silage and a light ration of ground oats daily. She consumed during the ninety days' feeding 3,785 pounds of corn silage and 270 pounds of the oat chop. The following table shows variation in weight and her production:

Date.	Weight.	Milk.	Average test.	Fat.	Date.	Weight.	Milk.	Average test.	Fat.
	<i>Lbs.</i>	<i>Lbs.</i>	<i>P. ct.</i>	<i>Lbs.</i>		<i>Lbs.</i>	<i>Lbs.</i>	<i>P. ct.</i>	<i>Lbs.</i>
December 1.	955	196	5.8	11.36	March 1	925	195	5.8	11.31
January 1.	945	199	5.9	11.74	April 1.	890	221	5.5	12.15
February 1	905	178	5.7	10.15	April 30.	860	-----	-----	-----

The cow was in good condition at the close of the experiment, which indicates that silage may with safety constitute a large portion of the ration of a dairy cow.

This experiment was undertaken at the suggestion of the Government agrostologist to determine in a measure if it were practicable to winter cattle in Alaska on grass silage.

The 3 pounds of ground oats were fed daily for the purpose of bringing the corn silage up to a protein standard equaling that of mixed grass silage.

Protein percentage of feed consumed.

Ground oats	11.56
Corn silage	1.58
Protein percentage of grass silage (approximately)	2.72

Average amount of total protein consumed daily in 42 pounds of corn silage and 3 pounds of ground oats, 1.01 pounds. Approximate amount of protein contained in 10 pounds of grass silage, 1.08 pounds.

It will thus be seen that this test indicates that cattle can be successfully wintered on grass silage and that dairy cows may be expected to yield a reasonable amount of milk when fed exclusively on this feed.

ALASKAN EXPERIENCE IN STOCK RAISING.

Hogs.—A few hogs were seen at various Alaska villages. They are fed refuse, and graze on various succulent plants when obtainable. They are very fond of wild rice, the bulb of a lilylike plant (*Fritillaria kamschatica*), which, however, is not very abundant. Unfortunately these animals are prone to feed on fish offal and other sea refuse, and as a consequence their flesh has a disagreeable flavor. Unquestionably there is too little feed adapted to hogs to make their raising profitable in Alaska.

Goats.—Angora goats have been tested by the Alaska Commercial Company at Kadiak and by Rev. C. P. Coe at Wood Island. According to Mr. Washburn, formerly resident superintendent of the Alaska Commercial Company at Kadiak, the company had a few years ago about 50 head of these animals on Ukamak Island, near Kadiak, which were entirely self-sustaining, increasing about 60 per cent each year. The mohair is said to have been good, both in quantity and quality.

Rev. C. P. Coe, of Wood Island, has several head of Angora goats which have passed the last two winters with but little care. This year his herd has shown very satisfactory increase, and no difficulty is anticipated in wintering the kids. A large part of their feed is derived from willows and other browse, and where this is abundant the animals need but little feed in winter. Owing to their tractability and the ease with which they are kept, especially where browse is abundant, Angora goats should prove most useful animals both for the natives and for whites.

Sheep husbandry.—Two definite attempts have been made to establish sheep raising in south Alaska, though small numbers have been kept at various points for short periods. The first attempt was made by the Alaska Commercial Company, which in 1883 imported a band of about 300 sheep from California. Unfortunately no accurate record of this experiment is available, and the accounts of various persons differ considerably. Many of the sheep died the first winter, according to some reports from lack of shelter, according to others from scab. The remainder were kept on a small island near Kadiak, where the only shelter was a small grove of spruce, but in winter they were usually transferred to new grazing grounds where they could feed on the tall, dry grass. In very severe weather they were sometimes sheltered and fed hay. These sheep are said to have yielded about 5 pounds of excellent wool per head each year, and the annual increase is reported to have been about 60 per cent of the adult animals. No particular care was given them, and the last were slaughtered about six years ago. The venture, even excluding the loss of the first winter, seems not to have been profitable.

The only sheep now in Alaska are on the ranch of the Frye-Bruhn Company, near Kadiak, who have about 80 head. These sheep are the remnant of 9,000 which were shipped in from Oregon in 1902 and 1903, the remainder having perished. At first sight it would seem that this appalling loss of more than 98 per cent was conclusive evidence that sheep raising in Alaska is not likely to prove profitable. Inquiry into the causes of the mortality do not bear out this conclusion necessarily. About 500 of the sheep were drowned in March, 1903, by being caught at the head of a narrow cove by the incoming tide. One hundred and fifty head were lost by becoming frightened and jumping over cliffs. The rest of those that died succumbed to scab, which broke out in January, 1903. Owing to lack of shelter it was then impossible to treat them by dipping, as that would practically have been equivalent to killing them. The result was that all but 80 died of the disease. Thus all the mortality was due to causes entirely preventable. It was interesting to learn that several head of these sheep which ran wild survived the winter without care, and the writer was informed by trustworthy witnesses of other cases of this kind. In the light of present knowledge it is difficult to say whether sheep can be profitably raised in southwestern Alaska.

In regard to the two attempts which have been made, it is noteworthy that in both instances the animals were shipped from a comparatively warm and dry climate to one cool and notably wet; furthermore, that none of them perished from any cause directly connected with the Alaska conditions.

There are, however, some further difficulties in connection with

sheep raising in Alaska which need careful consideration. It is the general opinion in Kadiak that in an ordinary winter sheep can not safely be left without care after the beginning of January. Indeed, many would place the time a month or six weeks earlier. New grass never appears before May 15, and often not until June 1. Therefore, under the best of conditions, sheep will need four and a half months of feeding and shelter. The superintendent of the Frye-Brunu ranch, after one winter's experience, thinks that feed and shelter should be given for a longer period than that mentioned.

Another serious difficulty lies in the lateness of the lambing season. It is generally agreed that lambing should not take place before June 1. The lambs will need shelter and feed by December 1 or earlier, unless one takes serious chances of losing many.

Whether sheep raising could be made profitable at present under such conditions remains to be demonstrated. The mere fact that sheep in small numbers have wintered without care is no proof that successful sheep husbandry can thus be carried on, nor even that one or two months' feeding will suffice. The risks involved in such a procedure are too great to warrant a careful stock raiser in taking any chances.

Destructive wild animals are no menace to sheep raising on the islands. Eagles may destroy a few lambs, but these birds are easily exterminated. Kadiak bears are too scarce and too easily destroyed to merit consideration. On the mainland, however, both wolves and brown bears may prove troublesome.

In the light of present knowledge one is safe in saying that sheep can be raised on the Alaska coast if adults are given five months' feed and shelter and the lambs a month more—this with the ordinary sheep of the western ranges. With more hardy breeds better adapted to the conditions the outlook for success would be better. It need hardly be said that extreme caution should be taken to import only perfectly healthy animals. The great mortality caused by scab and the great danger of such a disease as foot-rot in a damp climate demand that extreme care be taken not to introduce these diseases.

Cattle.—Cattle have been raised at nearly all the Alaskan coast settlements ever since the Russian occupation. Some of the original stock, according to local tradition, is still represented in the band of cattle at Nainilchuck. These are small animals, but said to be very hardy. Nearly all of the cattle kept near the villages are milch cows, mostly grades, but a number of Holsteins and Jerseys were seen. When owned by whites the animals are given shelter and feed for about five months. When they belong to the natives they are forced to exist through the winter with little or no care, eking out an existence by feeding on browse and seaweeds. No accurate data could be

gathered concerning the amount and character of the milk yield, but it was universally said that the milk is most excellent in summer, and good in winter when the animals are properly fed. It is unfortunate that no accurate records could be obtained as to the winter yield of cows fed only on native hay or silage.

Several herds of beef cattle have been successfully maintained in the neighborhood of Kadiak. The experience of the Alaska Commercial Company is thus summarized by Mr. Washburn, the former superintendent at Kadiak:

We have bred stock on the islands of Kadiak, Ukamak, and on Long Island. On Long Island we have about 40 head of cattle. These cattle are fed from two to six weeks each winter. The remainder of the time they have been able to get their own subsistence. During occasional winters we have carried our stock through with no feeding. We have had very good increase from them, and should say that the percentage of calves raised from the breeding cows is about 75. The cattle on this island have not been housed except during the short period when we were obliged to feed them.

On Ukamak Island we have a herd of about 20 head, which are entirely self-sustaining. We have not found it necessary either to feed or shelter these cattle during the winter season, and the increase has been fully as good as that of the herd on Long Island.

On Kadiak Island we have not kept any stock cattle, but only a herd of dairy cows and some working horses. These we have, of course, fed regularly during the winter season for about five months. We are able to cure sufficient hay on a lot we have leveled, and we have used the only mowing machine in western Alaska. We have obtained very good results from feeding the Alaska hay to both cows and horses, and find that they require no more grain when fed this hay than when we feed hay imported from California.

The Frye-Bruhn Company, of Seattle, began operations near Kadiak in July, 1903, importing about 200 head of beef cattle, mostly Herefords. Owing to unpreparedness and inexperience, about 140 head of this number were lost during the first year. Most of these were killed by falling over cliffs. Owing to the fact that the earliest grass appears on the steep southerly slopes, the cattle crowded in such places; in some instances the sod, loosened by the frost, gave way and precipitated them over the cliffs. In other cases the cattle used their horns when crowded, the wounded ones losing their foothold in endeavoring to escape. As precautions, more care is taken in selecting the early feeding grounds and the cattle have been dehorned.

The common experience of cattle owners in Alaska has been that the animals fatten readily on the grass in the spring, and remain in good condition without care until late in the autumn. Some Herefords slaughtered at Kadiak in July furnished beef of remarkably fine quality.

From the experience had at the Kenai Experiment Station, oxen keep in good working condition all winter on no other feed than native grass hay and silage, and the limited experience of others

has given similar results. It is not probable, however, that animals will remain fat on such feeds alone.

Nothing has been done up to the present time in the way of introducing breeds that are likely to be especially adapted to the peculiar conditions. It is highly probable, as has been pointed out by Professor Georgeson, that long-haired hardy breeds like the Galloway or the West Highland cattle will prove much more successful than breeds adapted primarily to a drier and warmer climate.

POPULATION AND AVAILABLE MARKETS.

No very accurate data are available as to the present population of the Alaska coast towns and villages, which furnish the only markets close to the grass lands. The population of the principal towns along the coast is approximately as follows: Sitka, 1,500; Valdez, 1,000; Seward, 500; Kadiak, 50; Unalaska and Dutch Harbor, 600. The total population from Valdez to Unalaska, inclusive, is about 8,000, of whom less than one-half are whites. From Valdez to Sitka, excluding the former, the population is perhaps 4,000, about half of them white. Thus the coast of Alaska from Sitka to Unalaska provides a market population at present of not more than 6,000 people, as no market for meat or dairy products can be expected so far as the natives are concerned.

No account is here taken of the towns lying along the interior channels in southeastern Alaska, whose populations aggregate perhaps 8,000 whites, though a portion of this market could perhaps be reached.

Skagway and Valdez are the principal south Alaskan points which supply the interior, and consequently are of especial importance in considering markets.

A considerable market for beef and dairy products could perhaps be established by shipping from Unalaska to the population of the Nome district and the lower Yukon. Unalaska is on the line of transportation from Puget Sound to Nome and the Yukon River, though at present few of the vessels stop there.

Thus the present available markets in Alaska for live-stock products are very limited. The supply for these markets at the present time is shipped from Puget Sound.

It is evident, however, that it is possible to raise in Alaska far more produce of this kind than the local markets can consume. The only other markets that can possibly be reached are those furnished by the cities of British Columbia and of the State of Washington. Freight rates are at present, and perhaps will be for some time to come, such that dairy products and wool are the only articles that could profitably be shipped to such distant ports.

No predictions can here be ventured concerning the future development of south Alaska. The present resources are mainly furs, fisheries, and mines. The fur industry is becoming less and less important. The fisheries are already highly developed, but are capable of considerable increase. The mines undoubtedly will become more and more important. It is probable, too, that the extensive explorations now carried on in prospecting for oil will result in the development of another important industry.

FREIGHTS AND TRANSPORTATION.

At the present time both freight and passenger rates to and between Alaskan ports may be considered moderate. The great bulk of the freight traffic is northward, a condition that is not unlikely to continue. Any permanent increase in the traffic to and from Alaskan ports will naturally be accompanied by a corresponding lowering of rates. The transportation companies doing business in south Alaska seem to be quite as liberal as conditions will permit, and so far as expressed sentiment goes their general policy will be the wise one of encouraging as far as possible any industry that promises to add to the sum total of the traffic.

DESIRABILITY OF SOUTH ALASKA AS A HOME.

Climate.—The south Alaska coast lies in the same latitude as northern Labrador, the north of Scotland, and the south of Sweden, but none of these regions is very similar to it. In fact, south Alaska has several peculiarities which render close comparison with any other region difficult. In general, the climate is a moist one, accompanied by no great extremes in temperature. The thermometer very seldom reaches zero in winter, nor does it exceed 75° F. in summer.

The following tables give the more important meteorological data as compiled from various published reports, localities in Sweden, Canada, and the State of Washington being included for comparison:

Monthly and annual mean temperatures at points in Alaska and elsewhere.

Station.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.
Sitka <i>a</i>	31.4	32.9	35.6	40.8	47.0	52.4	55.4	55.9	51.5	44.9	38.1	33.3	43.3
Sitka <i>b</i>	34.2	33.0	37.2	41.9	46.9	51.6	54.4	56.6	52.3	45.7	39.8	36.0	44.5
Kadiak	30.0	28.2	32.6	36.3	43.2	49.5	54.7	55.2	50.0	42.3	34.7	30.5	40.6
Unalaska <i>a</i>	30.0	31.9	30.4	35.6	40.9	46.3	50.6	51.9	45.5	37.6	33.6	30.1	38.7
Unalaska <i>b</i>	33.5	30.5	32.6	35.2	40.4	45.9	49.6	50.3	46.0	40.4	34.6	32.8	39.3
Port Angeles, Wash.	34.7	36.7	41.7	45.6	50.6	54.0	56.6	56.8	52.7	47.7	42.4	38.2	46.1
Ottawa, Canada	11.9	12.2	17.6	41.5	63.6	66.9	70.4	68.7	57.7	43.1	34.5	17.8	42.1
Stockholm, Sweden	33.5	29.5	33.8	39.5	52.5	57.0	59.1	59.3	53.6	40.6	35.6	27.3	43.4

a From records kept by the Russian Government.

b From records of the United States Signal Service

Average precipitation at points in Alaska.

Station.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Total precipi- tation, May 1 to Sept. 30.
	<i>In.</i>	<i>In.</i>	<i>In.</i>	<i>In.</i>	<i>In.</i>	<i>In.</i>	<i>In.</i>	<i>In.</i>	<i>In.</i>	<i>In.</i>	<i>In.</i>	<i>In.</i>	<i>In.</i>	<i>In.</i>
Sitka	7.95	8.02	7.78	5.03	3.89	3.87	4.14	6.67	10.94	12.96	10.77	8.52	90.54	29.51
Kadiak	6.56	3.70	4.86	4.01	5.92	4.91	3.38	4.97	7.26	8.09	6.56	7.91	68.16	26.44
Unalaska	13.81	7.68	6.48	7.51	4.49	4.26	2.78	3.40	8.64	11.98	9.30	11.81	92.14	23.57

In comparing the data for Sitka, Kadiak, and Unalaska it will be noted that the average mean temperature of Sitka is a little higher than that of Kadiak, which in turn is higher than that of Unalaska. It will also be noted that Sitka and Unalaska have about the same rainfall—considerably greater than that of Kadiak.

A matter of more practical consequence than either the copious rainfall or the comparatively high mean temperature is the rather low total of effective temperatures during the months from May to September, inclusive. By effective temperature is meant that above 43° F., at which plant growth practically begins. These totals, as compiled by Evans,^a are as follows:

Sitka	1,479.4
Kadiak	1,152.1
Unalaska	624.5
Port Angeles, Wash.	1,671.0
Ottawa, Canada	5,424.7
Scotland	1,692.7
Stockholm, Sweden	2,704.9

The difference in totals between Sitka and Kadiak is very striking, but not so much as that between Kadiak and Unalaska. Undoubtedly this effective temperature factor is the principal cause of the sharp demarcation between the timbered and the timberless regions on the Alaska coast.

Garden products.—This same factor—the low total of effective temperatures—limits also the variety of garden products that can be grown, but along the whole coast a considerable variety of vegetables is successfully raised, such as potatoes, turnips, cabbage, cauliflower, Brussels sprouts, kale, lettuce, peas, radishes, and rhubarb. Red currants and red raspberries grow wild on Cook Inlet, and these hardy varieties will thrive at most places along the coast—at Sitka even the ordinary garden varieties ripening. In southeastern Alaska salmon berries, cranberries, and huckleberries grow wild in abundance.

^a Bulletin No. 18, Office of Experiment Stations, U. S. Department of Agriculture.

Fuel.—In the timbered region a supply of fuel is easily obtainable, while in the timberless country a rather scant quantity is secured from scrubby willows and alders and from beach drift. Coal of an inferior quality, but still fairly satisfactory for domestic use, is abundant along Cook Inlet. At present none of this is mined, but considerable quantities are gathered from exposed ledges, or from drift on the beaches. Most of the coal used along the Alaska Peninsula, however, is at present shipped from Puget Sound. In some localities the paraffin residue from oil seepage is utilized as fuel.

CHOICE OF A LOCATION.

In general, Kadiak and the neighboring islands and the Cook Inlet country are the most favorable places for live-stock raising on account of a great luxuriance of grasses and contiguity to timber. The Cook Inlet region enjoys the reputation of being the garden spot of the Alaska coast, apparently producing finer vegetables than elsewhere, though lying farther north than the Alaska Peninsula and most of the territory described in these pages. The accessible grass lands here are, however, comparatively limited.

On the other hand, Uualaska and the neighboring islands, while possessing less abundant grass and perhaps a less favorable climate, can perhaps reach markets in the Nome region and on the lower Yukon. At Yakutat, while the grass is not overabundant, the location is more favorable for shipments southward.

The prime requisite of any Alaska location is a sufficiently large available supply of winter forage. Of summer range there is an abundance nearly everywhere, but the utilization of this is definitely limited by the number of cattle one can safely winter. The all-important point is therefore to have a sufficient acreage of land from which hay or silage can be secured. By selecting locations on the flat lands that so commonly occur at the heads of the narrow fiords one can easily control for all practical purposes great areas of grazing lands.

The writer can not refrain from quoting here the following opinion of a widely traveled man from California, who for three years has been engaged in placer mining on the beach on the west side of Kadiak Island and who is seriously considering taking up a homestead and bringing his family to Alaska:

In all my travels I have never found a place where one can live so well or so cheaply as I have done for the past three years. I can raise all sorts of hardy vegetables and berries, besides the wild ones, and have unlimited grass to keep cattle and sheep. Fish of the choicest sorts—salmon, halibut, cod, and many others—are very abundant, and the stream flowing by my cabin door swarms with trout. In the way of big game there are bears. Of small game

ducks and geese are plentiful in the spring and fall, and fresh gull eggs may be had for the gathering. To add to all this, if ready money is not available, I can always make good wages at least by washing out gold on the beach.

Surely there is here a combination of resources that makes failure well-nigh impossible.

LAND LAWS APPLYING TO ALASKA.

The following report regarding the methods by which title may be secured to agricultural lands in Alaska was prepared in the office of the Commissioner of the General Land Office, through the courtesy of the Secretary of the Interior. It refers solely to acquiring title to agricultural lands and not to the town-site or mineral laws, or to mission claims under section 27 of the act of June 6, 1900 (31 Stat. L., 330):

Section 1 of the act of Congress approved May 11, 1898 (30 Stat. L., 409), extending the homestead laws to Alaska, may be summarized as follows:

First. Extending the homestead laws and the rights incident thereto to the district of Alaska.

Second. Extending to such district the right to enter surveyed lands under provisions of law relating to the acquisition of title through soldiers' additional homestead rights.

Third. Granting the right to enter unsurveyed lands in said district under provisions of law relating to the acquisition of title through soldiers' additional homestead rights.

Fourth. Prohibiting the location in said district of any indemnity, deficiency, or lieu lands pertaining to any land grant whatsoever originating outside of said district.

Fifth. Limiting each entry under this section to 80 rods along the shore of any navigable water, and reserving along such shore a space at least 80 rods between all such claims, and prohibiting the entry or disposal of the shore (meaning land lying between high and low water mark) of any navigable waters within said district.

Sixth. Limiting each homestead in said district, whether soldiers' additional or otherwise, to 80 acres in extent.

This section was amended by the act of March 3, 1903 (32 Stat. L., 1028), the provisions of which may be stated as follows:

The amendatory act does not specifically reenact that portion of the act of 1898 which granted the right to enter *unsurveyed* lands in the district of Alaska under the provisions of law relating to the acquisition of title through soldiers' additional rights, but it is provided thereby "that no more than one hundred and sixty acres shall be entered in any single body by such scrip, lieu selection, or soldiers' additional homestead right," which seems to negative any intention to modify or repeal the existing law with regard to the exercise of such rights in the district of Alaska further than to limit the amount which may be entered in a single body to 160 acres. Further, that portion of the amendatory act which provides that "no indemnity, deficiency, or lieu-land selections pertaining to any land grant outside of the district of Alaska shall be made, and no land scrip or land warrant of any kind whatsoever shall be located within or exercised upon any lands in said district, except as now provided by law," seems to

recognize that there are such outstanding rights; but, unless soldiers' additional homestead rights are thereby considered as scrip rights, this Department is not advised as to any other law permitting the exercise of any such rights in the district of Alaska. Soldiers' additional homestead applications, under sections 2306 and 2307, Revised Statutes, are received as heretofore, but not more than 160 acres can be taken in a single body.

The act of 1898 is amended so as to increase the amount of land which may be entered as a homestead in the district of Alaska to 320 acres, and in providing therefor grants such rights to "any person who is qualified under existing laws to make homestead entry of the public lands of the United States who has settled upon, or who shall hereafter settle upon, any of the public lands of the United States situated in the district of Alaska, whether surveyed or unsurveyed." If a person be qualified, therefore, to make homestead entry under existing laws, he may enter not to exceed 320 acres, upon which he may have settled, in the district of Alaska, and without regard to the amount he might be authorized to make homestead entry of elsewhere; but the right to locate a soldier's additional homestead right in the district of Alaska, without settlement, is not thereby changed. Only 160 acres or less may be commuted.

No entry of any kind in the district of Alaska can, however, be allowed for land extending more than 160 rods along the shore of any navigable water, which is twice the extent originally permitted by the act of 1898, and along such shore a space of at least 80 rods is reserved between all claims, being the same as originally provided in the act of 1898.

HOMESTEADS.

The homestead laws secure to qualified persons the right to settle upon, enter, and acquire title to not exceeding 320 acres of public land, by establishing and maintaining residence thereon and improving and cultivating the land for the continuous period of five years.

A homestead entryman must be the head of a family or a person who has arrived at the age of 21 years, and a citizen of the United States, or one who has filed his declaration of intention to become such, as required by the naturalization laws, to which section 5 of the act of March 3, 1891 (26 Stat. L., 1095), attaches the conditions that he must not be the proprietor of more than 160 acres of land in any State or Territory, and that since August 30, 1890, he has not acquired title to, nor is now claiming under any of the agricultural public-land laws, an amount of land which, together with the land now applied for, will exceed in the aggregate 320 acres.

Where a wife has been divorced from her husband or deserted, so that she is dependent upon her own resources for support, she can make homestead entry as the head of a family or as a femme sole.

Where an unmarried woman settles upon a tract of public land, improves the same, establishes and maintains a bona fide residence thereon with the intention of appropriating the same for a home under the homestead law, and thereafter marries before making entry of said land, or before making application to enter said land, she does not, on account of her marriage, forfeit her right to make entry and receive patent for the land: *Provided*, That she does not abandon her residence on said land and is otherwise qualified to make homestead entry: *And provided further*, That the man whom she marries is not, at the time of their marriage, claiming a separate tract of land under the homestead law. (Act June 6, 1900, 31 Stat. L., 683.)

APPLICATION FOR A HOMESTEAD FOR SURVEYED LAND.

To obtain a homestead the party should select and personally examine the land and be satisfied of its character and true description.

He must file an application, stating his true name, residence, and post office address, and describing the land he desires to enter, and make affidavit that he is not the proprietor of more than 160 acres of land in any State or Territory; that he is a citizen of the United States, or that he has filed his declaration of intention to become such, and that he is the head of a family, or over 21 years of age, as the case may be; that his application is honestly and in good faith made for the purpose of actual settlement and cultivation, and not for the benefit of any other person, persons, or corporation, and that he will faithfully and honestly endeavor to comply with all the requirements of law as to settlement, residence, and cultivation necessary to acquire title to the land applied for; that he is not acting as agent of any person, corporation, or syndicate in making such entry, nor in collusion with any person, corporation, or syndicate to give them the benefit of the land entered, or any part thereof, or the timber thereon; that he does not apply to enter the same for the purpose of speculation, but in good faith to obtain a home for himself, and that he has not, directly or indirectly, made, and will not make, any agreement or contract in any manner with any person or persons, corporation, or syndicate whatsoever, by which the title which he might acquire from the Government of the United States should inure, in whole or in part, to the benefit of any person except himself; and, further, that since August 30, 1890, he has not acquired title to nor is he claiming under any of the agricultural public-land laws an amount of land which, together with the land he is seeking to enter, will exceed in the aggregate 320 acres, and that he has not theretofore had the benefit of the homestead laws, and must pay the legal fee and that part of the commissions which is payable when entry is made, and furnish the usual nonmineral affidavit.

On compliance by the party with the foregoing requirements the receiver will issue his receipt for the fee and that part of the commissions paid, a duplicate of which he will deliver to the party. The matter will then be entered in the records of the district office and reported to the General Land Office.

The applicant must in every case state in his application his place of actual residence and his post-office address, in order that notices of proceedings relative to his entry may be sent him. The register and receiver will note the post-office address on their tract books.

INCEPTIVE RIGHTS OF HOMESTEAD SETTLERS.

An inceptive right is vested in the settler by the proceedings hereinbefore described. He must, within six months after making his entry, establish his actual residence in a house upon the land, and must reside upon and cultivate the land continuously in accordance with law for the term of five years. Occasional visits to the land once in six months or oftener do not constitute residence. The homestead party must actually inhabit the land and make it the home of himself and family, as well as improve and cultivate it.

At the expiration of five years, or within two years thereafter, he may make proof of his compliance with law by residence, improvement, and cultivation for the full period required, and must show that the land has not been alienated except as provided in section 2288, Revised Statutes (sec. 2291, Rev. Stat.), as amended by section 3 of the act of March 3, 1891 (26 Stat. L., 1095),

The period of continuous residence and cultivation begins to run at the date of actual settlement in case the entry at the district land office is made within the prescribed period (three months) thereafter or before the intervention of a valid adverse claim. If the settlement is on unsurveyed land, the latter period runs from the filing of plat in the district land office. (Act May 14, 1880, 21 Stat. L., 140.)

HOMESTEAD SETTLERS ON UNSURVEYED LANDS.

A homestead settler on unsurveyed public land not yet open to entry must make entry within three months after the filing of the township plat of survey in the district land office. (Act May 14, 1880, 21 Stat. L., 140.)

CULTIVATION IN GRAZING DISTRICTS.

In grazing districts stock raising and dairy production are so nearly akin to agricultural pursuits as to justify the issue of patent upon proof of permanent settlement and the use of the land for such purposes.

Proofs can only be made by the homestead claimant in person, and can not be made by an agent, attorney, assignee, or other person, except that in case of the death of the entryman proof can be made by the statutory successor to the homestead right in the manner provided by law.

Sections 2291 and 2292, Revised Statutes, provide for obtaining title to lands entered by a homestead settler by his heirs. The act of June 8, 1880 (21 Stat. L., 166), provides for homestead claimants who become insane.

HOMESTEAD CLAIMS NOT LIABLE FOR DEBT AND NOT SALABLE.

No lands acquired under the provisions of the homestead laws are liable for the satisfaction of any debt contracted prior to the issue of the patent. (Sec. 2296, Rev. Stat.)

The sale of a homestead claim by the settler to another party before becoming entitled to a patent vests no title or equities in the purchaser as against the United States. In making final proof the settler is by law required to swear that no part of the land has been alienated except for church, cemetery, or school purposes or the right of way for railroads, canals, or ditches for irrigation or drainage across it. (Sec. 2288, Rev. Stat., as amended by sec. 3 of the act of March 3, 1891, 26 Stat. L., 1095.)

SOLDIERS AND SAILORS' HOMESTEAD RIGHTS.

Any officer, soldier, seaman, or marine who served for not less than ninety days in the Army or Navy of the United States during the rebellion, and who was honorably discharged and has remained loyal to the Government, and who makes a homestead entry of 320 acres or less on any land subject to such entry, is entitled under section 2305 of the Revised Statutes to have the term of his service in the Army or Navy, not exceeding four years, deducted from the period of five years' residence required under the homestead laws.

If the party was discharged from service on account of wounds or disabilities incurred in the line of duty the whole term of enlistment, not exceeding four years, is to be deducted from the homestead period of five years; but no patent can issue to any homestead settler who has not resided upon, improved, and cultivated his homestead for a period of at least one year after he commenced his improvements. (Sec. 2305, Rev. Stat.)

Similar provisions are made in the acts of June 16, 1898 (30 Stat. L., 473), and March 1, 1901 (31 Stat. L., 817), for the benefit of like persons who served in the late war with Spain or during the suppression of the insurrection in the Philippines.

A party applying to make entry under the provisions of section 2304 must file with the register and receiver a certified copy of his certificate of discharge, showing when he enlisted and when he was discharged; or the affidavit of two respectable, disinterested witnesses corroborative of the allegations contained in the prescribed affidavit (Form 1-065) on these points, or, if neither can be procured, his own affidavit to that effect.

The widow or, in case of her death or remarriage, the guardian of minor children may complete a filing made by the soldier or sailor as above, and patent will issue accordingly.

SOLDIERS' ADDITIONAL HOMESTEAD ENTRY.

Any officer, soldier, sailor, or marine who served for not less than ninety days in the Army or Navy of the United States during said wars, who had, prior to June 22, 1871, the date of the approval of the Revised Statutes, made a homestead entry of less than 160 acres, may enter an additional quantity of land, adjacent to his former entry or elsewhere, sufficient to make, with the previous entry, 160 acres. (Rev. Stat., 2306.) This right was extended by section 2307, Revised Statutes, to the widow, if unmarried; otherwise to the minor orphan children by proper guardian. If there be no widow, unmarried, and no minor orphan children, the right is held to be an asset of the soldier-entryman's estate, to be disposed of by his personal representative as other personal property. (29 L. D., 510 and 658.) An assignment by the heirs will be accepted if accompanied by a certificate of the proper court showing that no administration has ever been had on the soldier's estate and that they are all the heirs entitled to the right. The right was formerly regarded as a personal one and not transferable, but under authority of the decision of the Supreme Court of the United States in the case of *Webster v. Luther* (163 U. S., 331), it is now held to be assignable without restriction, and residence and cultivation are not required in its exercise, either by the original beneficiary or by his assignee, whether the original entry was perfected or abandoned (24 L. D., 502).

It was formerly the practice, on proof of military service and original entry, under section 2306, Revised Statutes, to issue a certificate in the name of the soldier-entryman, showing his additional right and its area, but the practice was discontinued by circular of February 13, 1883 (1 L. D., 654), and it is held that there is no statutory authority for the same and that the soldier can obtain the right for himself and sell it to another without certification (23 L. D., 152).

By the act of March 3, 1893 (27 Stat. L., 593), provision is made that where soldiers' additional homestead entries have been made or initiated upon a certificate of the Commissioner of the General Land Office of the right to make such entry, and the certificate of right is found to be erroneous or invalid for any cause, the party in interest thereunder on making proof of his purchase may, if there is no adverse claimant, perfect his title by payment of the Government price for the land, but no person may acquire more than 160 acres through the location of any such certificate.

By the act of August 18, 1891 (28 Stat. L., 397), all certificates regularly issued are declared to be valid, notwithstanding any attempted sale or transfer, and holders thereof desiring to exercise a right of entry in their own names

must file such certificates in the General Land Office, together with satisfactory proof of ownership and of bona fide purchase for value. If, upon examination, the proof so filed is satisfactory, an additional certificate will be attached to the original authorizing the location thereof, or entry of land therewith, in the name of the assignee or his assigns. (Circular of October 16, 1894; 19 L. D., 302.)

Existing homestead laws, while recognizing settlement upon unsurveyed public lands, do not authorize the entry or the patenting thereof until the public surveys have been regularly extended over them. This section as amended, however, in terms authorizes the entry of unsurveyed lands in Alaska, and makes provision for a private survey for the purpose of patenting the claim, if the public surveys have not been extended thereto at the time it is desired to submit proof, as is hereinafter referred to.

In executing surveys for homestead applications the instructions now prevailing will be followed, and the limit of 160 rods as to frontage will be measured along the meandered line of said frontage.

The form of the tract sought to be entered, if upon unsurveyed land, is prescribed in the act as follows:

If any of the land * * * is unsurveyed, then the land * * * must be in rectangular form, not more than a mile in length, and located upon the north and south lines run according to the true meridian.

That is, the boundary lines of each entry must be run in cardinal directions, true north-and-south and east-and-west lines by reference to a true meridian (not magnetic), with the exception of the meander lines on meanderable streams and navigable waters forming a part of the boundary lines of the entry. Thus a frontage meander line, and other meander lines which form part of the boundary of a claim, will be run according to the directions in the Manual of Surveying Instructions issued by this Office, but other boundary lines will be run in true east-and-west and north-and-south directions, thus forming rectangles, except at intersections with meander lines.

In other respects the rules previously adopted to govern surveys of claims under the act of May 14, 1898, will continue to be followed, of course taking into consideration the limitations as to area of claims.

Every person who is qualified under existing laws to make a homestead entry of the public lands of the United States who settles or has settled upon any of the unsurveyed public lands of the United States in the district of Alaska with the intention of taking the same under the homestead law shall, within ninety days from date of settlement or prior to the intervention of an adverse claim, file the record of his location for record in the recording district in which the land is situated, as provided by sections 13 to 16 of the act of June 6, 1900 (31 Stat. L., 326 to 328).

Said record shall contain the name of the settler, the date of settlement, and such description of the land settled on, by reference to some natural object or permanent monument as will identify the same.

If at the expiration of the time required under sections 2291 and 2292, Revised Statutes, and as modified by section 2305, Revised Statutes, or at such date as the settler desires to commute under section 2301, Revised Statutes, the public surveys have not been extended over the land located, the locator may secure a patent for the land located by procuring, at his own expense, a survey of the land, which must be made by a deputy surveyor who has been duly appointed by the surveyor-general, in accordance with section 10 of the act of May 14, 1898 (30 Stat L., 409), and the provisions of the act of March 3, 1903, as herein set forth.

When the survey, either public or private, as herein provided for is approved by the surveyor-general under authority of this Office, the same rules should be followed as heretofore established governing the location of soldiers' additional homestead rights, in addition to which the settler must furnish the required proof of residence and cultivation.

The office of the surveyor-general of Alaska is located at Sitka.

Section 10 of said act of May 11, 1898, also provides that all affidavits, testimony, proofs, and other papers provided for by this act and by said act of March 3, 1891, or by any departmental or Executive regulation thereunder, by depositions or otherwise, under commission from the register and receiver of the land office, which may have been or may hereafter be taken and sworn to anywhere in the United States, before any court, judge, or other officer authorized by law to administer an oath, shall be admitted in evidence as if taken before the register and receiver of the proper local land office. And thereafter such proof, together with a certified copy of the field notes and plat of the survey of the claim, shall be filed in the office of the surveyor-general of the district of Alaska, and if such survey and plat shall be approved by him, certified copies thereof, together with the claimant's application, shall be filed in the United States land office in the land district in which the claim is situated, whereupon, at the expense of claimant, the register of such land office shall cause notice of such application to be published for at least sixty days in a newspaper of general circulation published nearest the claim within the district of Alaska, and the applicant shall at the time of filing such field notes, plat, and application to purchase in the land office aforesaid, cause a copy of such plat, together with the application to purchase, to be posted upon the claim, and such plat and application shall be kept posted in a conspicuous place on such claim continuously for at least sixty days, and during such period of posting and publication, or within thirty days thereafter, any person, corporation, or association having or asserting any adverse interest in, or claim to, the tract of land or any part thereof sought to be purchased, may file in the land office where such application is pending, under oath, an adverse claim setting forth the nature and extent thereof, and such adverse claimant shall, within sixty days after the filing of such adverse claim, begin action to quiet title in a court of competent jurisdiction within the district of Alaska, and thereafter no patent shall issue for such claim until the final adjudication of the rights of the parties, and such patent shall then be issued in conformity with the final decree of the court.

When a settler desires to commute, the survey and homestead application must cover his entire claim, but only 160 acres, or less, thereof may be commuted, in which event the entry will stand intact as to the portion not commuted, subject to future compliance with the requirements of law within the statutory period of seven years.

Entrymen who commute will be required to pay, in addition to the price of \$1.25 per acre, the same fees and commissions as in final homesteads.

Whenever a settler or other claimant desires to make entry or submit final proof, he should address the register and receiver of the United States land office at Juneau, Alaska.

PLATES.

DESCRIPTION OF PLATES.

PLATE I. Map of Alaska, showing the approximate location of the grass-land areas in black.

PLATE II. Fig. 1.—View of the level lands at the head of Womans Bay, Kadiak Island. Similar areas occur at the heads of most of the inlets. Fig. 2.—Mowing beach rye on the Frye-Bruhn ranch.

PLATE III. Bluetop (*Calamagrostis langsdorfii*) on Kadiak Island, 6 feet high, July, 1904. The hillsides in the background were burned over during the preceding spring, and are covered with an equally luxuriant stand of the same grass.

PLATE IV. Fig. 1.—A view of Kadiak, November 7, 1903. A light fall of new snow covers the low mountains in the background. Fig. 2.—Another view of Kadiak, March 26, 1904. The small snowfall of this region is made very clear by these two pictures.



FIG. 1. A VIEW OF THE FLAT LANDS LYING AT THE HEAD OF WOMAN'S BAY, KADIAK ISLAND, ALASKA.



FIG. 2.—MOWING BEACH RYE ON KADIAK ISLAND, ALASKA.

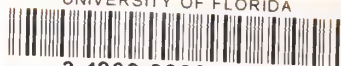


BLUETOP CALAMAGROSTIS LANGSDORFFII SIX FEET HIGH, ON KADIAK ISLAND, ALASKA, JULY, 1904.

The grass on the hillside in the background was just as luxuriant

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54. Persian Gulf Dates. 1903. Price, 10 cents.
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73. The Development of Single-Germ Beet Seed. 1905. Price, 10 cents.
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